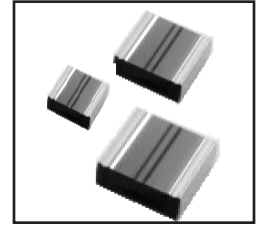


FEATURES

- HIGH CAPACITANCE (UP TO 22 μ F)
- WIDE VOLTAGE & TEMPERATURE RANGE (16 ~ 100V, -55°C ~ +125°C)
- UPGRADE PERFORMANCE VS. MLCC's
 - STABLE OVER FREQUENCY, TEMPERATURE & VOLTAGE
 - NO PIEZO ELECTRIC EFFECT
- IDEAL FOR AUDIO APPLICATIONS
- TYPICAL OPEN FAILURE MODE
- +260°C FLOW AND REFLOW SOLDERING COMPATIBLE



SPECIFICATIONS	Case Sizes							
	0603	0805	1206	1210	1812	2220	1206	1210
Capacitance Range	0.0001μF (100pF) ~ 22μF*						0.001μF ~ 0.047μF*	0.068μF ~ 0.1μF*
Voltage Ratings	16, 25, 35, 50 & 63VDC						100VDC	
Capacitance Tolerance	±10% (K), ±20% (M)*							
Temperature Range	-55°C ~ +125°C						-55°C ~ +125°C	
Dissipation Factor (20°C)	1.5% (measured at 5Vrms, 1KHz)							
Insulation Resistance (20°C)	C ≤ 0.1μF: 3,000MΩ Minimum C > 0.1μF: 300M • μF Minimum						1,000MΩ Minimum	
Dielectric Withstanding Voltage	No abnormalities after application of 150% of rated voltage for 1 minute or 175% of rated voltage for 1 ~ 5 seconds							

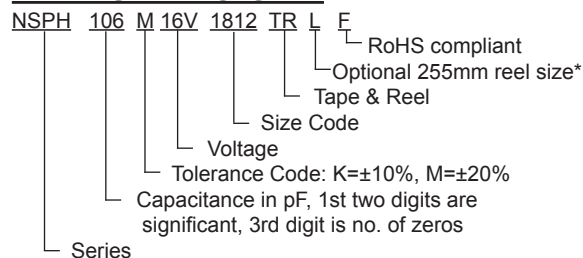
*Measured at $\leq$ 5Vrms, 1KHz

ENVIRONMENTAL CHARACTERISTICS

High Temperature Life Test* ¹ +125°C $\pm 3^\circ$ C, 1,000 Hrs +48/-0 Hrs 125% of Rated Voltage	Capacitance Change	Within +5%/-20% of Initial Value
	Dissipation Factor	2.0% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 μ F: 30M Ω $\cdot$ μ F Minimum 16V ~ 63V, C $\leq$ 0.1 μ F & 100V: 300M Ω Minimum
Humidity Load Life* ¹ 500 Hours, +40°C & 90% ~ 95% RH at rated voltage	Capacitance Change	Within $\pm 20\%$ of Initial Value
	Dissipation Factor	3.0% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 μ F: 30M Ω $\cdot$ μ F Minimum 16V ~ 63V, C $\leq$ 0.1 μ F & 100V: 300M Ω Minimum
Temperature Cycling* ¹ No Load, 5 cycles of -55°C (30 $\pm$ 3 minutes), Room temperature $\leq$ 3 minutes +125°C (30 $\pm$ 3 minutes), Room temperature $\leq$ 3 minutes	Capacitance Change	Within +5%/-20% of Initial Value
	Dissipation Factor	2.0% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 μ F: 30M Ω $\cdot$ μ F Minimum 16V ~ 63V, C $\leq$ 0.1 μ F & 100V: 300M Ω Minimum
Resistance to Soldering Heat - Dip Method Solder Temperature +260°C Dip time 5 $\pm$ 1 seconds Reflow method: twice at recommended reflow temperature	Capacitance Change	Within +5%/-10% of Initial Value
	Dissipation Factor	1.65% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 μ F: 100M Ω $\cdot$ μ F Minimum 16V ~ 63V, C $\leq$ 0.1 μ F & 100V: 1,000M Ω Minimum

*¹ The capacitor shall be mounted on the PC board with recommended reflow conditions.

PART NUMBER SYSTEM



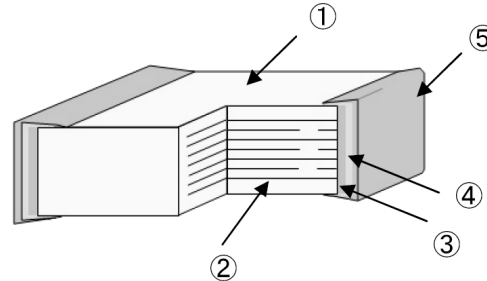
*Contact NIC for availability of larger 255mm reels

AC VOLTAGE RATINGS

NSPH Vdc Rating	Vrms	Vpeak
16Vdc	11.3	16
25Vdc	17.7	25
35Vdc	24.7	35
50Vdc	35.4	50
63Vdc	44.5	63
100Vdc	70.8	100

CONSTRUCTION

Part	Materials
1	Capacitor Element
2	Internal Electrode
3	First Termination Layer
4	Second Termination Layer
5	Third Termination Layer



STANDARD VALUES AND CASE SIZES (mm)

Part Number	Voltage (VDC)	Capacitance (μF)	Available Tolerance	L±0.3 L±0.2*	W±0.3 W±0.2*	H±0.2 H±0.15*	e±0.3 e±0.2*	Case Size	Reel Qty 180mm
NSPH473_16V0603TRF	16	0.047	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH154_16V0805TRF	16	0.15	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH224_16V0805TRF	16	0.22	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH105_16V1206TRF	16	1.0	±10% (K), ±20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH155_16V1206TRF	16	1.5	±10% (K), ±20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH225_16V1210TRF	16	2.2	±10% (K), ±20% (M)	3.2	2.5	1.8	0.4	1210	2,000
NSPH335_16V1210TRF	16	3.3	±10% (K), ±20% (M)	3.2	2.5	2.0	0.4	1210	2,000
NSPH475_16V1812TRF	16	4.7	±10% (K), ±20% (M)	4.5	3.2	1.4	0.4	1812	1,000
NSPH685_16V1812TRF	16	6.8	±10% (K), ±20% (M)	4.5	3.2	1.8	0.4	1812	1,000
NSPH106_16V1812TRF	16	10	±10% (K), ±20% (M)	4.5	3.2	2.6	0.4	1812	500
NSPH156_16V2220TRF	16	15	±10% (K), ±20% (M)	5.7	5	1.8	0.4	2220	1,000
NSPH226_16V2220TRF	16	22	±10% (K), ±20% (M)	5.7	5	2.6	0.4	2220	500
NSPH333_25V0603TRF	25	0.033	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH104_25V0805TRF	25	0.10	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH154_25V0805TRF	25	0.15	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH684_25V1206TRF	25	0.68	±10% (K), ±20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH105_25V1206TRF	25	1.0	±10% (K), ±20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH155_25V1210TRF	25	1.5	±10% (K), ±20% (M)	3.2	2.5	2.0	0.4	1210	2,000
NSPH225_25V1210TRF	25	2.2	±10% (K), ±20% (M)	3.2	2.5	1.8	0.4	1210	2,000
NSPH335_25V1812TRF	25	3.3	±10% (K), ±20% (M)	4.5	3.2	1.4	0.4	1812	1,000
NSPH475_25V1812TRF	25	4.7	±10% (K), ±20% (M)	4.5	3.2	1.8	0.4	1812	1,000
NSPH685_25V1812TRF	25	6.8	±10% (K), ±20% (M)	4.5	3.2	2.6	0.4	1812	500
NSPH106_25V2220TRF	25	10	±10% (K), ±20% (M)	5.7	5	1.8	0.4	2220	1,000
NSPH156_25V2220TRF	25	15	±10% (K), ±20% (M)	5.7	5	2.6	0.4	2220	500
NSPH153_35V0603TRF	35	0.015	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH223_35V0603TRF	35	0.022	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH473_35V0805TRF	35	0.047	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH683_35V0805TRF	35	0.068	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH104_35V0805TRF	35	0.10	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH474_35V1206TRF	35	0.47	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH684_35V1206TRF	35	0.68	±10% (K), ±20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH105_35V1210TRF	35	1.0	±10% (K), ±20% (M)	3.2	2.5	1.4	0.4	1210	2,000
NSPH155_35V1210TRF	35	1.5	±10% (K), ±20% (M)	3.2	2.5	2.0	0.4	1210	2,000
NSPH225_35V1812TRF	35	2.2	±10% (K), ±20% (M)	4.5	3.2	1.4	0.4	1812	1,000
NSPH335_35V1812TRF	35	3.3	±10% (K), ±20% (M)	4.5	3.2	1.8	0.4	1812	1,000
NSPH475_35V1812TRF	35	4.7	±10% (K), ±20% (M)	4.5	3.2	2.6	0.4	1812	500
NSPH685_35V2220TRF	35	6.8	±10% (K), ±20% (M)	5.7	5	1.8	0.4	2220	1,000
NSPH106_35V2220TRF	35	10	±10% (K), ±20% (M)	5.7	5	2.6	0.4	2220	500

*tolerance for 0603 parts



STANDARD VALUES AND CASE SIZES (mm)

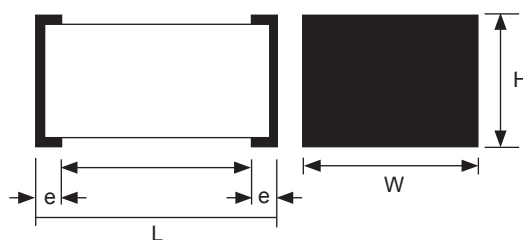
Part Number	Voltage (VDC)	Capacitance (μF)	Available Tolerance	L±0.3 L±0.2*	W±0.3 W±0.2*	H±0.2 H±0.15*	e±0.3 e±0.2*	Case Size	Reel Qty 180mm
NSPH101_50V0603TRF	50	0.00010	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH151_50V0603TRF	50	0.00015	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH221_50V0603TRF	50	0.00022	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH331_50V0603TRF	50	0.00033	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH471_50V0603TRF	50	0.00047	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH681_50V0603TRF	50	0.00068	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH102_50V0603TRF	50	0.001	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH152_50V0603TRF	50	0.0015	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH222_50V0603TRF	50	0.0022	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH332_50V0603TRF	50	0.0033	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH472_50V0603TRF	50	0.0047	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH682_50V0603TRF	50	0.0068	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH103_50V0603TRF	50	0.010	±10% (K), ±20% (M)	1.6	0.8	0.65	0.32	0603	4,000
NSPH333_50V0805TRF	50	0.033	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH473_50V0805TRF	50	0.047	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH104_50V1206TRF	50	0.1	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH154_50V1206TRF	50	0.15	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH224_50V1206TRF	50	0.22	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH334_50V1206TRF	50	0.33	±10% (K), ±20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH474_50V1210TRF	50	0.47	±10% (K), ±20% (M)	3.2	2.5	1.4	0.4	1210	2,000
NSPH684_50V1210TRF	50	0.68	±10% (K), ±20% (M)	3.2	2.5	1.8	0.4	1210	2,000
NSPH105_50V1812TRF	50	1.0	±10% (K), ±20% (M)	4.5	3.2	1.4	0.4	1812	1,000
NSPH155_50V1812TRF	50	1.5	±10% (K), ±20% (M)	4.5	3.2	1.8	0.4	1812	1,000
NSPH225_50V1812TRF	50	2.2	±10% (K), ±20% (M)	4.5	3.2	2.6	0.4	1812	500
NSPH335_50V2220TRF	50	3.3	±10% (K), ±20% (M)	5.7	5	1.8	0.4	2220	1,000
NSPH475_50V2220TRF	50	4.7	±10% (K), ±20% (M)	5.7	5	2.6	0.4	2220	500
NSPH101_63V0805TRF	63	0.00010	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH151_63V0805TRF	63	0.00015	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH221_63V0805TRF	63	0.00022	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH331_63V0805TRF	63	0.00033	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH471_63V0805TRF	63	0.00047	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH681_63V0805TRF	63	0.00068	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH102_63V0805TRF	63	0.001	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH152_63V0805TRF	63	0.0015	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH222_63V0805TRF	63	0.0022	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH332_63V0805TRF	63	0.0033	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH472_63V0805TRF	63	0.0047	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH682_63V0805TRF	63	0.0068	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH103_63V0805TRF	63	0.010	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH153_63V0805TRF	63	0.015	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH223_63V0805TRF	63	0.022	±10% (K), ±20% (M)	2.0	1.25	0.8	0.4	0805	3,000
NSPH333_63V0805TRF	63	0.033	±10% (K), ±20% (M)	2.0	1.25	1.0	0.4	0805	3,000
NSPH473_63V1206TRF	63	0.047	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH683_63V1206TRF	63	0.068	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH104_63V1206TRF	63	0.1	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH154_63V1206TRF	63	0.15	±10% (K), ±20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH224_63V1206TRF	63	0.22	±10% (K), ±20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH334_63V1210TRF	63	0.33	±10% (K), ±20% (M)	3.2	2.5	1.4	0.4	1210	2,000
NSPH474_63V1210TRF	63	0.47	±10% (K), ±20% (M)	3.2	2.5	1.8	0.4	1210	2,000
NSPH684_63V1812TRF	63	0.68	±10% (K), ±20% (M)	4.5	3.2	1.4	0.4	1812	1,000
NSPH105_63V1812TRF	63	1.0	±10% (K), ±20% (M)	4.5	3.2	1.8	0.4	1812	1,000
NSPH155_63V1812TRF	63	1.5	±10% (K), ±20% (M)	4.5	3.2	2.6	0.4	1812	500
NSPH225_63V2220TRF	63	2.2	±10% (K), ±20% (M)	5.7	5.0	1.8	0.4	2220	1,000
NSPH335_63V2220TRF	63	3.3	±10% (K), ±20% (M)	5.7	5.0	2.6	0.4	2220	500

*tolerance for 0603 parts



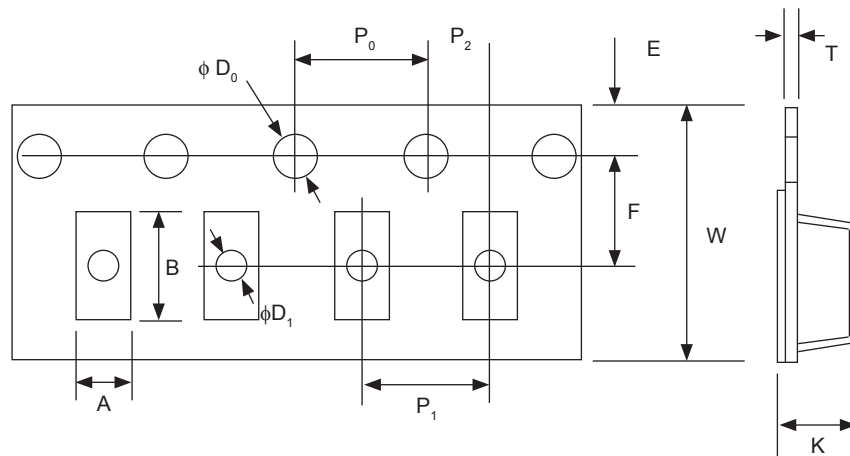
STANDARD VALUES AND CASE SIZES (mm)

Part Number	Voltage (VDC)	Capacitance (μ F)	Available Tolerance	L $\pm$ 0.3	W $\pm$ 0.3	H $\pm$ 0.2	e $\pm$ 0.3	Case Size	Reel Qty Tolerance
NSPH102_100V1206TRF	100	0.001	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH152_100V1206TRF	100	0.0015	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH222_100V1206TRF	100	0.0022	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH332_100V1206TRF	100	0.0033	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH472_100V1206TRF	100	0.0047	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH682_100V1206TRF	100	0.0068	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH103_100V1206TRF	100	0.01	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH153_100V1206TRF	100	0.015	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH223_100V1206TRF	100	0.022	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH333_100V1206TRF	100	0.033	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.0	0.4	1206	3,000
NSPH473_100V1206TRF	100	0.047	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	1.6	1.4	0.4	1206	2,000
NSPH683_100V1210TRF	100	0.068	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	2.5	1.4	0.4	1210	2,000
NSPH104_100V1210TRF	100	0.1	$\pm$ 10% (K), $\pm$ 20% (M)	3.2	2.5	1.8	0.4	1210	2,000



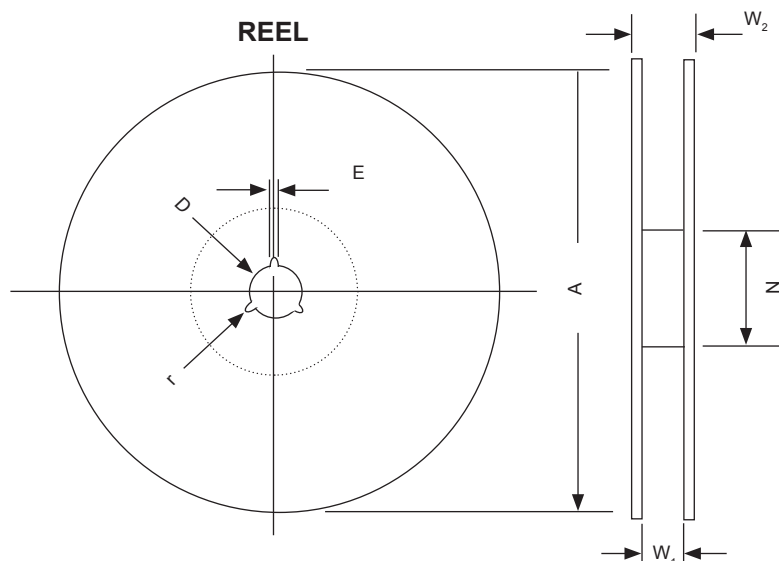
EMBOSED PLASTIC CARRIER DIMENSIONS (mm)

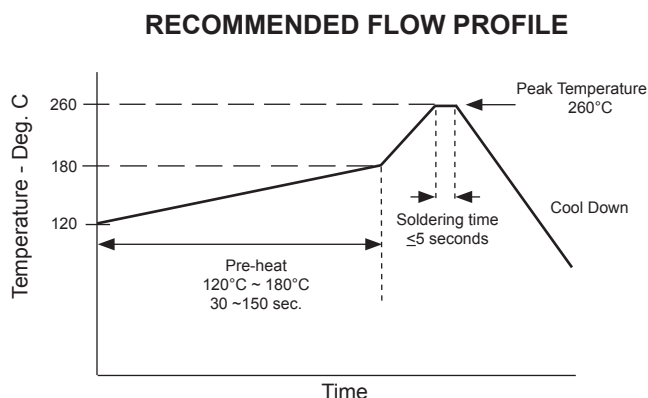
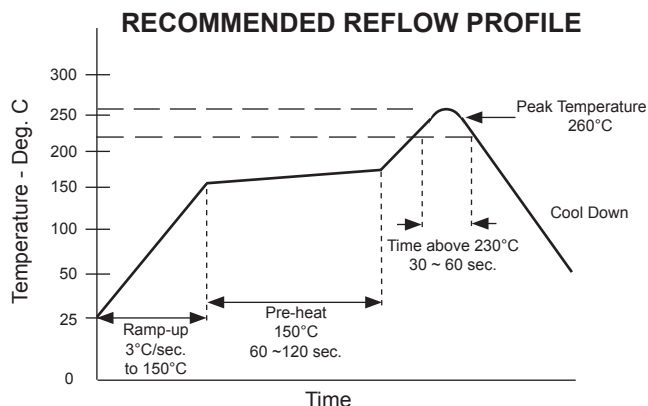
Size	Thickness	A ± 0.1	B ± 0.1	W ± 0.3	F ± 0.5	E ± 0.1	P ₁ ± 0.5	P ₂ ± 0.4	P ₀ ± 0.1	φ D ₀ ± 0.1	φ D ₁ +0.2/-0	K ± 0.1	T ± 0.05
0603	0.65	1.1	1.9	8.0	3.5	1.75	4.0	2.0	4.0	1.5	-	0.8	0.2
0805	0.80	1.45	2.25	8.0	3.5	1.75	4.0	2.0	4.0	1.5	1.0	1.0	0.25
	1.00											1.3	0.25
1206	1.00	2.0	3.6	8	3.5	1.75	4.0	2.0	4.0	1.5	1.0	1.4	0.2
	1.40											1.8	0.25
1210	1.40	2.9	3.6	8	3.5	1.75	4.0	2.0	4.0	1.5	1.0	1.8	0.25
	1.80											2.2	0.25
	2.00											2.4	0.25
1812	1.40	3.6	4.9	12	5.5	1.75	8.0	2.0	4.0	1.5	1.5	1.8	0.25
	1.80											2.2	0.25
	2.60											3.0	0.25
2220	1.80	5.4	6.1	12	5.5	1.75	8.0	2.0	4.0	1.5	1.5	2.2	0.25
	2.60											3.0	0.25



REEL DIMENSIONS (mm)

Case Size	A ± 1.0	N ± 1.0	W1 ± 1.0	W2 ± 1.0	φD ± 0.2	E ± 0.5	r ± 0.2
0603, 0805, 1206, 1210	180	60	9.5	13.1	13.0	2.0	1.0
1812, 2220	180	60	13.5	18.5	13.0	2.0	1.0
	255	80	13.5	18.5	13.0	2.0	1.0





Note: These capacitors are sensitive to moisture. The parts should be used within one year of shipping date while stored unopened in moisture barrier packaging at +5°C ~ 30°C and a relative humidity of ≤70% RH. Reflow or flow soldering should be completed within the time referenced below at +30°C/60% RH or less after opening the moisture barrier bag.

STORAGE TIME LIMIT AFTER OPENING MOISTURE BARRIER PACKAGING

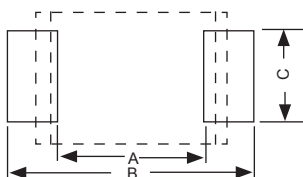
Size	Open Bag Storage Limit (+30°C/≤60% RH)	MSL*
0603	168 hours	3
0805	168 hours	3
1206	168 hours	3
1210	96 hours	4
1812	48 hours	5
2220	48 hours	5

*IPC/JEDEC J-STD-020-C

LAND PATTERN DIMENSIONS (mm)

Note: If flow soldering is used enlarge the "B" dimension reference below by 0.4 ~ 0.6mm.

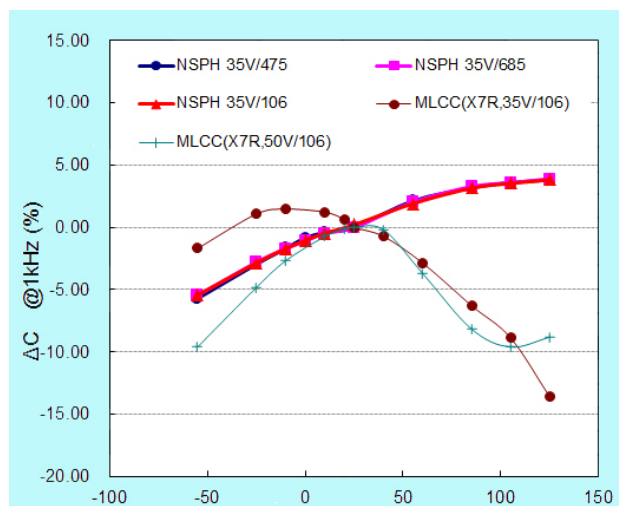
EIA Size	A ± 0.1	B ± 0.1	C ± 0.2
0603	0.5	2.0	0.7
0805	0.8	2.4	1.1
1206	1.8	3.6	1.4
1210	1.8	3.6	2.3
1812	2.7	5.7	3.0
2220	3.5	7.8	4.5



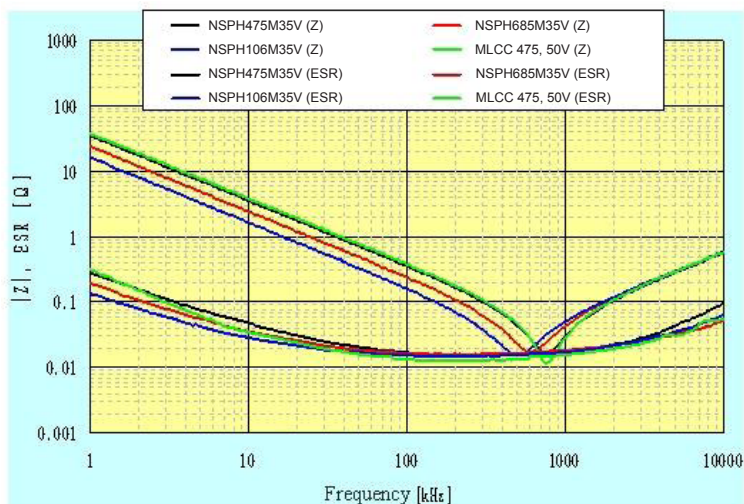
HAND SOLDERING (SOLDERING IRON)

Item	Condition
Chip Temperature	≤350°C
Soldering Time	≤4 Sec.
Power of Soldering Iron	≤30W
Other	No preheat

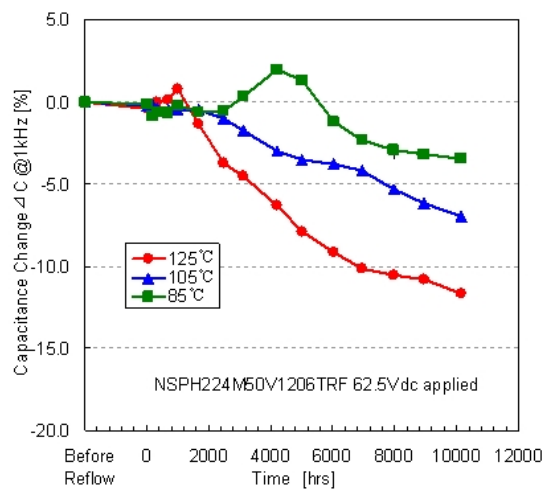
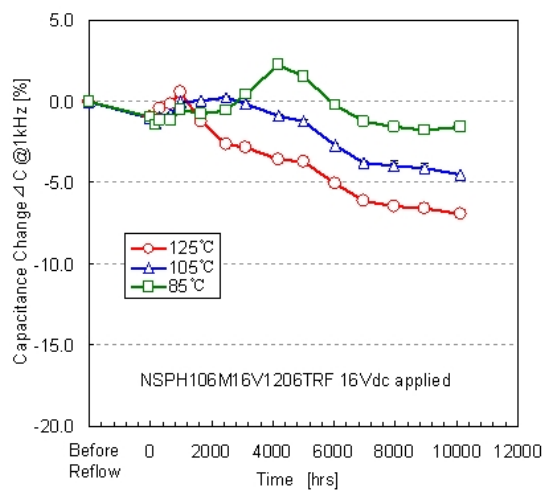
Typical Capacitance vs. Temperature
(NSPH vs. MLCC)



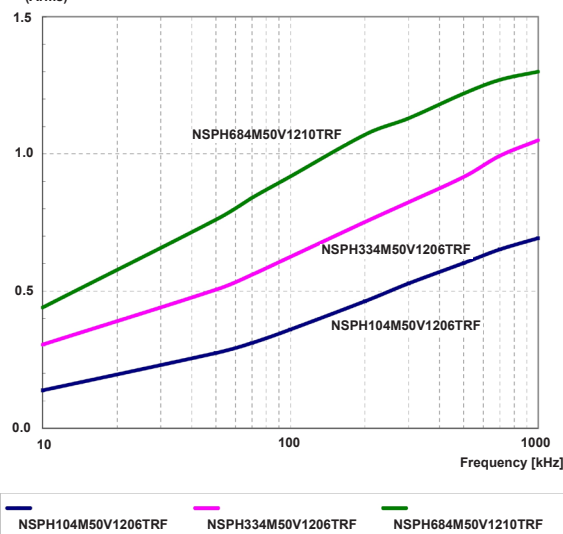
Typical ESR & Z vs. Frequency
(NSPH vs. MLCC)



High Temperature Load Life Test
(Typical Performance)



Permissible Current
(Arms)



1. Self-heating temperature rise due to current should not exceed 10°C
2. Contact NIC top review your circuit requirements: tpmg@niccomp.com